in the solar granules could be detected up to the limb of the Moon, and by this most delicate test any evidence of the existence of a lunar atmosphere was completely negatived.

Though the Château de Meudon had been in a great measure destroyed by the siege of Paris, yet the stables, nearly 100 metres long, remained intact, and were formed by Janssen into a very suitable laboratory for the study of absorption spectra, the divisions of the stalls forming excellent supports to the lengthy tubes he employed.

Jules Janssen was endowed with great energy, courage, and determination, which in no case are shown more conspicuously than in the ascents he made of Mount Blanc for the purpose of making spectroscopic observations in the higher strata of the atmosphere. He made two ascents, in 1893 and 1895. His lameness prevented him from walking, and consequently he was carried by porters from Chamounix to the summit—a quite unique performance. But this enabled him to arrive at that high altitude with a mind and body unwearied by physical exertion, and thus able to devote himself under the most favourable circumstances to the observations he proposed to make, and also to plan out an observatory on the summit. One of his principal objects was to determine the presence or not of oxygen in the Sun. He accordingly made his ascent in winter, so that the influence of aqueous vapour in the atmosphere might be at a minimum. His observations negatived the existence of oxygen in the solar atmosphere, though recent observations are of a more positive character.

His unwearied activity throughout his life is shown by the numerous contributions to the *Comptes Rendus*, the *Annales de Chimie*, and many other scientific publications.

In 1873 Janssen was elected a member of the Académie des Sciences and the Bureau des Longitudes. In 1875 he became a Foreign Member of the Royal Society, who in 1877 gave him the Rumford Medal. The Academies of Rome, St Petersburg, Edinburgh, Brussels, and Washington did honour to him by electing him as one of their corresponding members.

A cold caught last December developed into congestion of the lungs, from which he died on the 23rd of that month, leaving a devoted wife and daughter to mourn the loss of one who will always rank as one of the most eminent scientific men of his country. He was elected an Associate 1872 Nov. 8. E. B. K.

Maurice Loewy was born of Jewish parents at Vienna on April 15, 1833. He was educated at the Polytechnic School and at the University of Vienna, and received his astronomical training at the Imperial Observatory under the directorship of von Littrow. His first contribution to astronomical literature is in the *Sitzungsberichte* of the Vienna Academy for April 16, 1857, and consists of a determination of the elements of the minor planet Leda then just discovered. Other computations of a similar character followed, including one of the elements of Donati's comet.

In August 1860 he accepted an invitation of Le Verrier's to the Paris Observatory, and in the volume of Paris observations for 1861 the initials M. L. are frequently found against the observations made with the meridian circles, the circle of Gambey, and the equatorials. In 1864 he became naturalised, and in 1870 served his adopted country on the ramparts of Paris.

His interest in minor planets and comets continued. In particular he made several investigations of the orbit of Eugenia, allowing for the perturbations. In 1872 he published a theoretical paper for simplifying and expediting the computation of orbits, with a number of subsidiary tables.

M. Loewy's attention, as was to be expected in so skilful an observer, was attracted to the details of the meridian circle. By means of an optical apparatus in the central cube he devised a method of determining the flexure of the telescope at various zenith distances. With the same apparatus he was able to investigate the errors of the pivots. He also developed a method of observation of close polar stars at various points in their circular paths, which he applied to various problems of fundamental astronomy, such as the determination of latitude without using the declinations of fundamental stars, and the determination of right ascensions without relying on the right ascensions of the circumpolar stars. This interest in the details of meridian work continued to the end of his life, a paper which he passed for press shortly before his death being an account of a new method he had devised for determining the errors of a divided circle.

In 1871 M. Loewy prepared his new form of equatorial, to which the name of "Equatorial Coudé" was given. Delaunay, who was at that time Director of the observatory, was much impressed by the possibilities of this form of instrument, but owing to his death the project of constructing one was not carried out. The first instrument of this type was completed in 1882, and had an object-glass of $10\frac{1}{2}$ inches. This form of mounting is now so well known that it is not necessary to say more than that by reflection at two plane mirrors light from any part of the sky is directed into a fixed direction—that of the polar axis. The inconveniences which an observer with an equatorial must put up with are avoided. The observer can direct the instrument to any object without moving from his chair, and his observations are made under the most favourable conditions for his own comfort, similar to those under which the microscope is used by the student of natural history.* The possible drawbacks of this form of mounting are the loss of light at the two reflections and the possible flexure of the mirrors. The latter was avoided by making the mirrors thicker than was usual at that time. The performance of the coudé in the separation of double stars, and still more in the beautiful series of photographs of the Moon taken by Loewy and Puiseux, shows that the definition does not suffer appreciably by the two reflections.

* See Address delivered by the President, Mr. W. H. M. Christie, on presenting the Gold Medal of the Society to M. Loewy, *M.N.*, vol. xlix. p. 248.

M. Loewy's method of determining the constant of aberration is developed in a series of papers to the Academy of Sciences in the years 1886 and 1887. The peculiar liability of this constant to be affected by systematic error in the observations makes the differential method devised by M. Loewy of special value. By the ingenious device of a double mirror formed by silvering two faces of a prism placed in front of the object-glass, and capable of rotation about the axis of the telescope, he was able to view simultaneously two stars in widely different parts of the sky. The distance between two such stars is affected by aberration, and by observing this distance when the stars are at the same altitude, and again, three months later, when they are in the same position, a determination of the constant is obtained. The advantages of the method are that a comparatively large coefficient is involved, that errors due to precession and nutation are absolutely eliminated, and those due to refraction reduced to a minimum. By varying the conditions the same method of observation can be applied to determine the refraction, and it was for this purpose the instrument was originally constructed. The complete theory of the instrument, including the effect of temperature, change in the position of the axis round which the double mirror turns, the most suitable angle of the prism, and the choice of stars, are all carefully dealt with by M. Loewy. His theoretical conclusions as to the freedom of the instrument from systematic error were justified by experience; and though the results which were anticipated have not been realised as yet, the method constituted a new departure of great value. In this instrument, as well as in the equatorial coudé, M. Loewy has placed at our disposal methods of observation based on entirely new principles, and calculated to give astronomers improved and quite independent means of attacking several of the most important problems in our science.*

M. Loewy was elected a member of the Academy of Sciences in 1873, succeeding Delaunay. In the previous year he had been appointed a member of the Bureau of Longitudes. With Admiral Mouchez he instituted the Observatory of the Bureau of Longitudes in the Park Montsouris for the instruction of sailors and explorers. The determination of the difference of longitude between Paris and the cities of Berlin, Vienna, Algiers, and Marseilles are his own personal contributions to Geodetic Astronomy. For thirty years he edited the *Connaissance des Temps* and the astronomical part of the *Annuaire du Bureau des Longitudes.*

In 1878, when Admiral Mouchez became Director of the observatory, M. Loewy was made Assistant Director, and he held the same position under Tisserand whom he succeeded as Director in 1896. During this time the project for the International Photographic Chart and Catalogue of the Heavens took shape, a project to which the Paris Observatory contributed the optical skill of the brothers Henry and the organising ability of Admiral Mouchez. M. Loewy

* See Address delivered by the President, Mr. W. H. M. Christie, on presenting the Gold Medal of the Society to M. Loewy, *M.N.*, vol. xlix. p. 248.

interested himself in the details of this work from the start, and conducted researches on the best methods of measurement of the plates, and the derivation from the measures of the accurate positions of the stars. He also concerned himself with the reproduction of the chart plates, and inaugurated the publication on paper of enlarged copies of the original negatives. In his later years the two pieces of work to which he devoted greatest attention were the photographic atlas of the Moon, and the organisation and execution of the observations of Eros for the determination of the solar parallax. The photographs of the Moon, taken in collaboration with M. Puiseux, are of the greatest beauty and value. The coudé telescope being of long focus, gave an image of the Moon on a large scale, and this was subsequently further enlarged. An immense amount of care and labour was required to obtain photographs with such fine definition, not above one plate in ten, though taken in apparently good atmospheric conditions, being considered by the critical authors as sufficiently good for publication. This atlas gives a permanent record of the minutest details of the Moon at the present epoch; and should any changes occur, they will be detected by comparison of photographs taken in the future with those contained in the atlas of Loewy and Puiseux.

The Eros campaign, which was decided upon by the Astrographic Conference which met at Paris in 1900, brought a large amount of work, which he did not in the least shirk, upon M. Loewy. He undertook and carried out the preparation of ephemerides, the selection of reference stars, and the collection and publication of the results obtained at the different observatories. At the same time he obtained results of the highest degree of accuracy from the photographs taken at the observatory which he directed. He made extensive investigations of the precision which could be obtained by repeating the measures under different conditions; and if he erred at all, it was in having the plates measured with more care rather than with less than they required.

M. Loewy was a corresponding member of the Academies of St Petersburg, Vienna, Berlin, Rome, and Washington. He received the Gold Medal of the Royal Astronomical Society in 1889 for his invention of the equatorial coudé and his method of determining the constant of aberration. The conferences at Paris brought him in contact with astronomers from all countries. All who met him were impressed by his kindly disposition and his zeal for his work.

M. Loewy died suddenly on October 15 while speaking at a meeting of the Council of the French Observatories. He leaves a widow, two sons and four daughters. He was elected an Associate of the Society 1886 November 12. F. W. D.

M. Charles Trépied, Director of the Algiers Observatory, died suddenly on 1907 June 10, a few days after his return from the *Conférence Internationale des Études Solaires* held at Meudon in May last. On eclipse expeditions, at the successive meetings of